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PENSOFT

First record of *Plantago heterophylla* Nutt. (Plantaginaceae) for the Brazilian flora

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Abstract
We present the first record of *Plantago heterophylla* Nutt. (Plantaginaceae) to Brazil, based on specimens from Rio Grande, Rio Grande do Sul, Brazil. The species is easily recognized due to its linear leaves, 2 stamens, and pixidium with 10–30 seeds. *Plantago heterophylla* is considered native from United States and Mexico, but it is distributed as adventitious in the east of Argentina, Paraguay, and Uruguay. Images from the species and a distribution map illustrating its occurrence in the American continent are provided.

Key words
New occurrence, *Plantago* sect. *Micropsyllium*, Rio Grande do Sul, South America.

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Introduction

Plantago L. (Plantaginaceae) comprises about 250 species (Rahn 1996, Hassemer et al. 2015). It is a cosmopolitan genus composed of annual or perennial herbs or, rarely, subshrubs (Rønsted et al. 2002), distributed mainly in temperate and tropical altitude zones (Pilger 1937, Rahn 1996). The genus is defined by a set of morphological features, such as paralelinervous leaves, with axillary hairs, scale shaped corolla and absence of an apparent disc, dried stigma usually bilobate, protoginic flowers, anthers with an extension of connective present, and pollen grains with 4–15 apertures (Rahn 1996, Souza and Souza 2002, Hefler et al. 2011).

Several species of *Plantago* are known for being globally invasive in crops, such as *P. australis* Lam., *P. lanceolata* L., and *P. major* L. (Lorenzi 1982, Meudt 2012), these herbs also being used in traditional medicine as phytotherapics (Hefler et al. 2011). Although several species are cosmopolitan, the genus presents rare and endangered species, as in the case of *P. turficola* Rahn and *P. corvensis* Hassemer (Hassemer et al. 2016), and/or endemic to reduced areas, such as some oceanic islands of Atlantic Ocean, for example, *P. trinitatis* Rahn (Rahn 1974) and *P. moorei* Rahn (Meudt 2012).

Currently, 20 species of *Plantago* are recorded from Brazil (Souza and Hassemer 2015, Hassemer et al. 2016), with 3 of those being exotic species introduced from Europe (Hefler et al. 2011, Hassemer 2016). The southern region of the country presents the higher richness for the genus, encompassing more than 90% of the species recorded from Brazil.

Plantago heterophylla Nutt. belongs to the cosmopolitan *Plantago* subg. *Plantago,* which contains about 130

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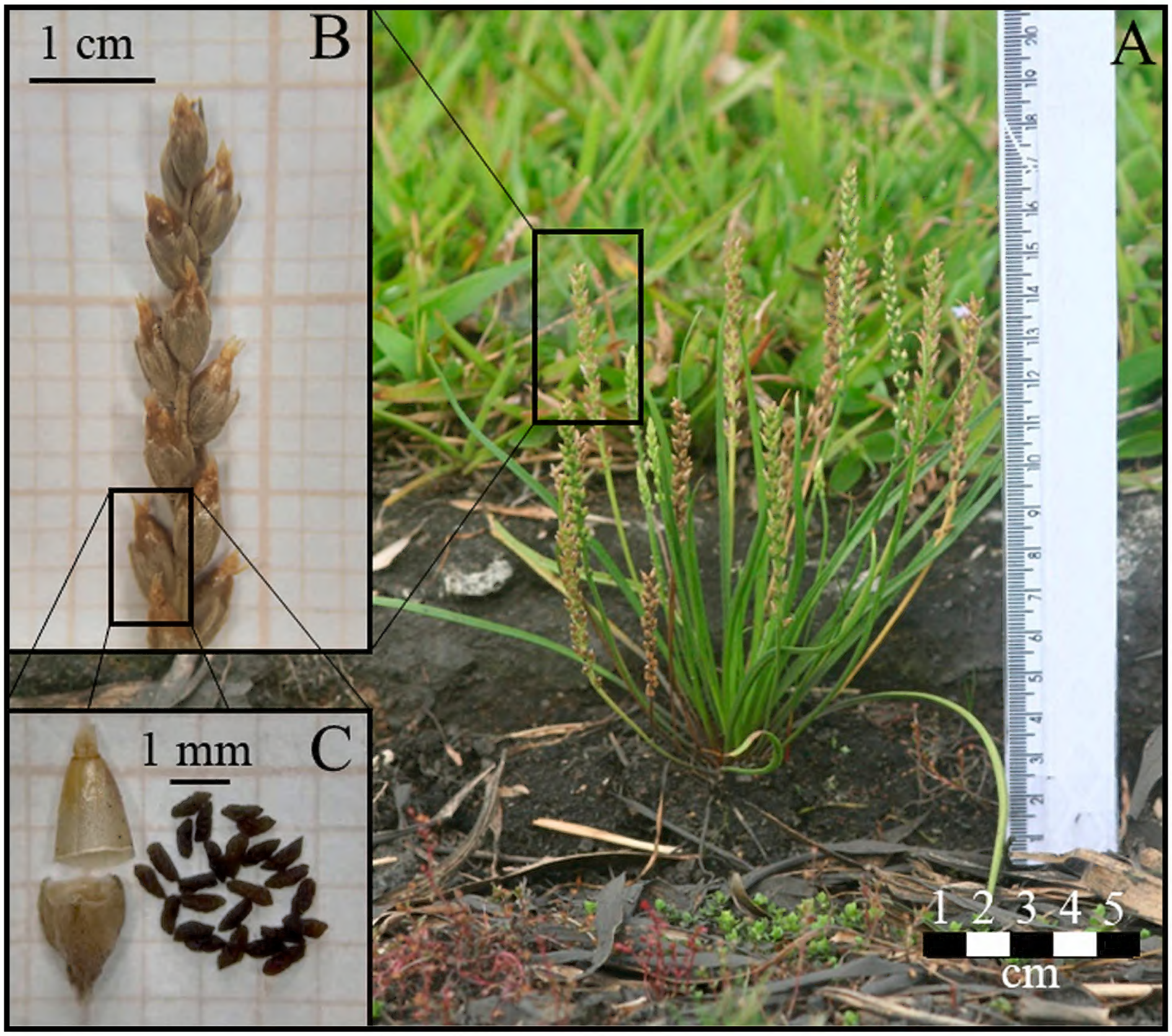

Figure 1. *Plantago heterophylla* Nutt. **A.** Image of *P. heterophylla* from the new record. **B.** Detail of the inflorescence. **C.** Details of the pixidium and seeds. Photographs by W. Matzenauer.

species (Ishikawa et al. 2009). This subgenus is divided in 5 sections proposed by Rahn (1996): *P.* sect. *Plantago*, *P.* sect. *Oliganthos* Barnéoud, *P.* sect. *Mesembrynia* Decne., *P.* sect. *Virginica* Barnéoud, and *P.* sect. *Micropsyllium* Decne. The section *Micropsyllium* comprises 6 annual species native to Europe, Asia and America, mainly characterized by the linear leaves and reduced flowers (Ishikawa et al. 2009).

We provide the first record of *P. heterophylla* for Brazil and present a short description, images from the collected specimens and habitat, and a map of occurrence of the species for the American continent.

Methods

During an update of the inventory of the *campus* "Carreiros", "Universidade Federal do Rio Grande" flora, published by Jacobi et al. (2013), several *P. heterophylla* specimens were collected in places under strong anthropic influence. For species identification, the plants were compared with images of type specimens and descriptions available. The collected specimens were deposited at herbarium HURG. For illustrating the sites of occurrence of *P. heterophylla* in South America, a map was prepared using the QGIS software, version 3.2.2 (QGIS Development Team).

Results

Plantago subg. *Plantago* sect. *Micropsyllium* Decne.

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Material examined. Brazil. Rio Grande do Sul: Rio Grande, campus Carreiros FURG (32°04′16.7″ S, 052°09′ 52.7″ W), grasslands, dry and plane, close to anthropic impacted areas, 6 December 2016, *W. Matzenauer & U. Jacobi 80* (HURG). Rio Grande do Sul, Rio Grande, campus Carreiros, FURG, 24 November 2016, *W. Matzenauer & U. Jacobi 90* (HURG).

Description. Small herbs; annual; tenuous filiform roots. Leaves disposed in rosette, 50–80 mm long, 2–4 mm

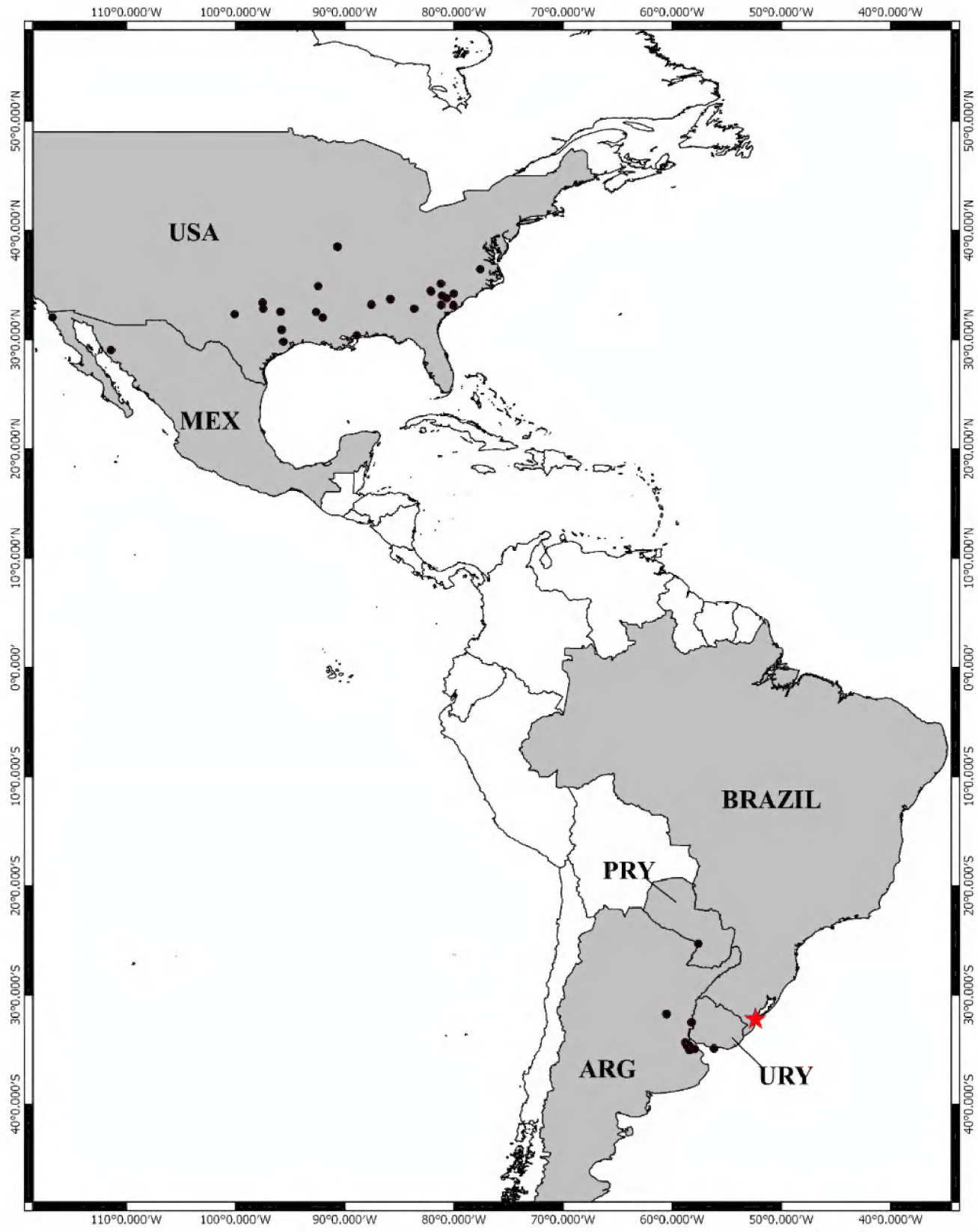

Figure 2. Current distribution of *P. heterophylla* in America, evidencing the bicentric occurrence of the species. Black dots indicate previously known records. The new records are indicated by a red star. Acronyms: USA – United States; MEX – Mexico; PRY – Paraguay; URY – Uruguay; ARG - Argentina. Source: the authors.

wide, linear; leaf blade entire or slightly toothed, glabrous or pubescent only at the base; cylindrical scapes, with apparent longitudinal bands, pubescent, antrorse trichomes, sparse, decumbent or ascendant, with different length from leaves, usually bigger (80–150 mm length); narrow spikes, up to 6 mm, 10–50 mm length, lax. Floral bracts 1.5–2 mm wide, 2–3.5 mm long, ovoid, glabrous; Sepals 1.5–2 mm long, 0.5–0.75 mm wide, rounded, protruding carina. Corolla (–) 0.5 mm long, ovoid lobules. Stamen 2, enclosed and with very short filaments (–) 0.3 mm. Pixidium 1.5–2.5 mm long, 0.75–1.5 mm wide, elliptic, with truncate apex, and 10–25 (–30) seeds. Oblong seeds, rugose surface, nut-brown to black.

Discussion

Plantago heterophylla is easily recognized by its linear leaves, pixidium with 10–30 seeds and bearing 2 stamens only. Due to its linear leaves (Fig. 1), *P. heterophylla* may be misidentified as *P. brasiliensis* Sims or *P. commersoniana* Decne., which have linear-lanceolate leaves. However, these are easily distinguished from *P. heterophylla* by having only 2 seeds for pixidium, and these two are distinguishable from each other by the corolla symmetry, which is actinomorphic in *P. commersoniana* and zygomorphic in *P. brasiliensis* (Hefler et al. 2011).

The new records of *P. heterophylla* were collected with flowers and fruits from October to December. The species has preference for plain and humid soils (Rahn, 1979), being usually invasive in crops (Bassett 1966). *Plantago heterophylla* has disjunct distribution, being recorded from North and South America (Fig. 2). In North America, it is well distributed in southwest of United States, where it is considered native, being documented for several states, such as Florida, Missouri, Georgia, Alabama, Tennessee and others (Bassett 1966, Hassemer et al. 2015). Recently, it has been recorded from the northwestern Mexican states of Sonora and Baja California (Villaseñor 2016).

In South America, *P. heterophylla* was first reported on 13 February 1876 in material collected by G. Hieronymus, deposited in the herbarium of the Universität Göttingen (GOET 008755). This specimen was used as type material for description of *Plantago aquatilis* Griseb. by A. Grisebach (1879), now considered synonymous of *P. heterophylla* (Bassett 1966).

Plantago heterophylla was recorded as a common species for Paraguay and eastern Argentina, mainly in the provinces of Corrientes and Entre Ríos (Rahn 1979). In Uruguay, where it was recorded by Hassemer et al. (2015) and Hassemer and Marchesi (2016), the species is considered rare and of restricted distribution, being included in the list of priority species for conservation (Marchesi et al. 2013). In Brazil, our record shows that the species is, for now, known only for the state of Rio Grande do Sul, in the southern extreme coastal lowlands, in the city of Rio Grande (Fig. 2). There is no information in the available literature that discusses the disjointed occurrence of *P. heterophylla* in American continent. As the species original description was based on the material collected in USA by T. Nuttall, the species is likely to be native of North America. This idea is reinforced, considering that *P.* section *Micropsyllium* is restricted to the northern hemisphere, particularly in the temperate regions (Ishikawa et al. 2009). Rahn (1996) also cites the natural occurrence of *P. heterophylla* for USA, but points that there are also records for from Argentina and Paraguay, which are more than 100 years old. The citation made by Rahn (1996) indicates that there might have been a misconception in pointing out *P. heterophylla* as exotic invasive species for South America.

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Author's Contribution

WM, MN and USJ collected the samples, SMH and WM identified the specimens, MN made the map, and WM, USJ and SMH wrote the paper.

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